645.

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

Project	Date	Author

TITLE

LASSEN VOLCANIC NATIONAL PARK
CALIFORNIA

Summary of Insect Surveys Carried Out
Between the Years 1930 and 1943

and

A Synopsis of Barkbeetle Control
Work Accomplished During the Period.

John E. Patterson

Bureau of Entomology & Plant Quarantine
Forest Insect Laboratory
Berkeley, California
March 15, 1944

SUBJECT—

INDEX No.—

U.S. GOVERNMENT PRINTING OFFICE 8—9742

1 copy typed

LASSEN VOLCANIC NATIONAL PARK
CALIFORNIA

Summary of Insect Surveys Carried Out Between the Years 1930 and 1943

and

A Synopsis of Barkbeetle Control Work Accomplished During the Period.

John E. Patterson

Bureau of Entomology & Plant Quarantine
Forest Insect Laboratory
Berkeley, California. March 15, 1944

LASSEN VOLCANIC NATIONAL PARK
CALIFORNIA

CHRONOLOGY OF FOREST INSECT SURVEYS 1930 - 1943.

FOREWORD

Organization of the Park forests into infestation areas of definite characteristics has made possible a plan of summarizing all insect notes and infestation information at hand in such a way that these data become readily comparable from year to year on the same areas and in the same stands.

Beginning with the year 1943 the organization became effective, and the report of infestations of that year signaled the adoption of the plan. In order to bring the available information on infestations of previous years into line with this present organizational scheme a summary of all reports and memoranda dating back to 1930 is recorded in the following sections.

The base map attached to this memorandum shows the organization of the different Park areas. It is the result of combining all previous records of surveys made in the Park and is as complete and detailed as our present knowledge of the terrain and timber stands permits. Responsibility for the segregation and naming of the areas rests with John E. Patterson who conceived the idea of a permanent survey set up for this park. However, other workers who preceded him are also responsible to the extent that their data were used in defining the infestation areas. Without this 13 year background knowledge would have been insufficient to prepare the plan.

REPORTING AREA

The entire park is considered one reporting area but, in itself, does not constitute a complete area inclusive of all potential infestations possibilities in the region. Areas outside the Park are in several cases necessarily a continuation of identical stand conditions within. For example, the Caribou Primitive Area of the Lassen National Forest is a continuation of the eastern lake section of the Park whereon identical conditions relative to site, stands, timber types, and insect hazards are present. Similarly, other areas adjoining the Park but outside its boundaries, are a part of the one reporting area. An enumeration of these adjoining areas includes: 1. South of the Park; a. Warner Valley and Red Mountain ridge to Feather River, b. Mill Creek canyon. 2. West of the Park: a. Rocky Peak ridge to boundary of Lassen Forest and north to County line, b. Red Mountain assembly to boundary of Lassen Forest and north to brush fields west of Manzanita Lake. 3. North of the Park:

a. A line meandering from Table Mountain to Red Lake Mountain, thence to Ash Pan Butte, skirting the Big Springs brush fields and on to West Prospect Peak. b. Including the area east of West Prospect and north of main Prospect peaks, northward to the lava flats. 4. East of the Park: a. The ridges eastward to the meridian intersecting Cone Lake. b. Caribou Peak Primitive Area.

For the present, however, the reporting area is restricted to the confines of the Park. Organization of infestation areas within the Park is shown in the following table. The unit numbers are intended to be permanent and may be used as indices for reference to the map, and also to the text citations. The acreages given are approximate and subject to revision on the strength of more accurate measurments.

TABLE I - Infestation Units - Lassen Volcanic National Park.

Number:	Name:	Total Sections:	Total Acreage:	Timbered Sections:	Timbered Acreage:	Stand Comp'st'n:
1.	Manzanita	6	3,840	4	2,560	PP-JP-LP
2.	Lost Creek	7	4,480	6	3,840	PP-JP-SP-WF
3.	Badger	8	5,120	7	4,480	PP-JP-LP
4.	Butte Lake	4	2,560	3	1,920	PP-JP-LP
5.	Warner Valley	15	9,600	8	5,120	JP-SP-WF
		40	25,600	28	17,920	
6.	Summit Lake	7	4,480	5	3,200	LP-WF
7.	Hat Mountain	15	9,600	13	8,320	LP-WF
8.	Snag Lake	28	17,920	20	12,800	LP-WF-JP
9.	Juniper Lake	27	17,280	20	12,800	LP-WF-RF-WP
10.	Pilot Mountain	7	4,280	6	3,840	WF-RF-LP-WP
11.	White Mountain	15,	9,600	12	7,680	RF-WF-WP
12.	Mill Creek	12	7,680	10	6,800	RF-WF-WP
		111	70,840	86	55,040	
13.	Loomis	13	8,320	12	7,680	RF-WF-WP
	Totals	164	104,760	126	80,640	

TABLE II - Composition of Timber Stands-Percentage of Species

Unit:		PP	SP	JP	LP	WP	WF	RF
1.	Manzanita	30%	5%	30%	5%		20%	10%
2.	Lost Creek	40%	5%	20%			30%	5%
3.	Badger	50%		20%	10%		20%	
4.	Butte Lake	60%		10%	5%		25%	
5.	Warner Valley	5%	10%	45%			30%	10%
6.	Summit Lake				80%		10%	10%
7.	Hat Mountain				40%	5%	30%	25%
8.	Snag Lake				50%	5%	25%	20%
9.	Juniper Lake				55%	5%	30%	10%
10.	Pilot Peak				5%	5%	60%	30%
11.	White Mountain				5%	5%	30%	40%
12.	Mill Creek		5%	5%	10%	5%	30%	45%
13.	Loomis		10%	10%	5%	3%	32%	40%
	Totals	14%	3%	11%	21%	2%	30%	19%

SURVEYS PRIOR TO 1943

During the 13 year period preceding 1943 the Park has been examined annually for insect depredations by representatives of the Bureau, or by Park personnel. Reports have been prepared each of this period setting forth the current infestation conditions found at that time, and generally, recommending certain management plans designed to alleviate insect caused damage when such was considered justified. In all 17 reports and memorandums have been submitted on insect conditions in this park since 1930. A list of the workers responsible for the various annual surveys and reports is included here in order to complete the past record.

TABLE III - ANNUAL SURVEYS AND REPORTS MADE SINCE 1930

Year:	Service Represented:	Individual:	Date of Report:
1930	Bureau of Entomology	K. A. Salman	July 28, 1930
1931	Bureau of Entomology	K. A. Salman	Aug, 30, 1931
1932	Bureau of Entomology	K. A. Salman	June 16, 1932
1932	National Park Service	Judson M. Rhoads	Oct 28, 1932
1932	Bureau of Entomology	K. A. Salman	Dec 13, 1932
1933	Bureau of Entomology	K. A. Salman	Sept 18, 1933
1933	National Park Service	Wm. B. Augustine	Nov 1933
1933	National Park Service	Wm. B. Augustine	Oct 28, 1933
1934	National Park Service	Walter C. Hale	Oct 31, 1934
1935	National Park Service	Eugene Barton	Nov 13, 1935
1936	Bureau of Entomology	K. A. Salman	Oct 22, 1936

TABLE III - Continued

1937	Bureau of Entomology	K. A. Salman	November 1, 1937
1938	National Park Service	Eugene J. Barton	November 1938
1938	Bureau of Entomology	K. A. Salman	November 27 1938
1939	National Park Service	John O. Preston	October 31, 1939
1940	Bureau of Entomology	R. C. Hall	February28, 1941
1941	Bureau of Entomology	R. C. Hall	December20, 1941
1942	Bureau of Entomology	Philip C. Johnson	May 5, 1943
1943	Bureau of Entomology	John E. Patterson	March 20, 1944

INFESTATION CONDITIONS 1930 to 1942

During the 13 year period from 1930 to 1942 considerable variation of infestation conditions occurred from year to year, or were so interpreted by the individuals who conducted the annual surveys. These conditions, of course, were reported as of limited extent and were tied more or less closely with local areas or landmarks. This system must be so in the absence of well defined permanent infestation areas which could be used from year to year. As a result annual infestation conditions as given in the reports for this period are not always readily comparable. However, in the following section, an attempt has been made to place the data gleaned from all these reports in the infestation units in which it is believed appropriate. There follows a summary of infestation data during the period.

1. Manzanita Lake:

1930 - Salman reported 2 Jeffrey pine trees killed in 1928 and 7 in 1929. He also reported 2 firs killed in 1929.
1932 - Rhoads estimated the 1931 loss in J. pine at 20 trees.
1933 - Augustine reported 8 J. pine trees killed during the year,
1934 - Walter C. Hale reported 6 lodgepole pine and 2 J. pine killed in 1934.
1937 - Salman reported 2 J. pine trees killed in 1936.
1938 - Barton reported low endemic infestation throughout the Park, including this area.
1939 - Salman reported 8 J. pine trees killed in 1939.
1941 - Hall reported the 1940 insect loss in this area at 28 J. pine, 1 lodgepole, 2 sugar pine, and 5 white fir trees.
1941 - Hall: 1940 loss amounted to 6 J. pine, 2 sugar pine, and 3 white fir trees.
1943 - Johnson estimated the loss for 1942 at 6 Jeffrey pine trees.

2. Lost Creek:

1932 - Rhoads estimated the 1931 infestation in J. pine as amounting to 8 killed trees.

1933 - Augustine estimated the 1933 kill in J. pine at 8 trees.
1934 - Hale marked 4 J. pine and 4 red fir trees of 1934 vintage along the highway.
1937 - Salman counted 12 J. pine trees of 1936 attack along the highway in the area.
1939 - Salman reported the 1939 loss to equal 25 infested J. pine trees.
1941 - Hall estimated the 1940 loss at 10 J. pine, 2 ponderosa pine, and 15 white fir trees. He also estimated the outlying infestation at 15 J. pine, 6 p.p., 3 sp. and 100 white fir trees.
1943 - Johnson reported 30 J.p. s.p. and p.p. trees on this area as representing the total 1942 loss.

3. Badger:

1930 - Salman reported reather heavy Dm. infestation in lodgepole, largely grouped but the groups were scattered. Groups consisted of 3 to 12 trees each.
1932 - Rhoads found the 1931 infestation in lodgepole to approximate an average of 3 trees per acre.
1934 - Hale marked only 1 lp killed in 1934 on the whole area.
1941 - Hall calculated the 1940 loss at 11 Jp, 1 pp. and 50 lp, and 2 wf. trees.
1941 - Hall estimated 2 jp trees for 1941.

4. Butte Lake:

1930 - Salman reported that this area was "exceptionally free of infestation".
1932 - Rhoads estimated a loss in lodgepole amounting to 140 trees, although he considered the infestation to be in a static condition. His loss estimate for 1931 in Jp was 15 trees.
1933 - Augustine reported 6 Jp. and 4 lp. killed in 1933.
1934 - According to Walter G. Hale 5 pp. 2 lp. and 2 Jp. trees were killed in 1934.
1939 - Salman estimated the 1939 loss at 15 Jp. and 5 pp. trees.
1941 - Hall reported the 1940 infestation as 11 Jp. 2 pp. and 15 Lp trees.
1941 - Hall estimated the 1941 loss at only 2 Jp. trees.
1943 - Johnson calculated the 1942 loss at 12 J. pine trees.

5. Warner Valley:

1930 - Salman reported a total of 15 Jp trees killed in 1929.
1934 - W. G. Hale marked 3 Jp. and 4 wf. trees of 1934 date on the area.
1941 - Hall estimated 20 Jp trees in 1940.
1941 - Hall calculated the 1941 loss at 21 Jp. trees.

6. Summit Lake:

1930 - Salman reported medium infestation in lodgepole pine. Estimated 75 trees killed in 1929. Fir infestation low but general.
1932 - Rhoads estimated lodgepole pine killed in 1931 averaged 18 trees per each 100 acres. Fir loss for same year averaged 1 tree per acre.
1934 - W. C. Hale reported 4 Lp and 22 rf. trees killed by beetles in 1934 along the Loop road in this area.
1941 - R. C. Hall figured the 1940 loss at 21 Jp. and 1 rf. trees.
1941 - Hall figured the loss in 1941 at 11 Lp. trees.

7. Hat Mountain:

Note: This area is off the beaten path so the stands have been largely ignored by estimators prior to 1943.

8. Snag Lake:

1932 - Rhoads reported a loss of 450 lodgepole pine trees killed in 1931. He believed the infestation to be increasing.
1933 - Augustine estimated the 1933 loss in lodgepole on 100 acres near the lake at 9 attacked trees.

9. Juniper Lake:

1930 - Salman: "The area surrounding the lake, and alsong the road leading to it - show but little insect damage". He found a few firs killed by Scolytus ventralis, and a few lodgepole pines killed by the mountain pine beetle.
1933 - Augustine - A total of 19 Lp killed on the campground areas during the year.
1941 - Hall estimated the 1940 loss at 21 lodgepole pine trees.
1941 - Hall estimated the roadside loss in 1940 at 40 Lp. and 50 rf. trees.

10. Pilot Mountain:

Prior to 1940 no one had estimated the insect losses on this area.

1941 - Hall figured the 1940 loss at 11 Jp., 50 Lp., and 2 wf. trees.

11. White Mountain:

1930 - Salman reported medium to heavy infestations in fir. Recommended control measures.
1932 - Rhoads reported epidemic conditions in fir. Estimated the 1931 loss to be 145 trees on 40 acres.
1939 - Salman the fir loss in 1939 to equal 150 trees.
1941 - Hall reported the 1940 loss in Kings Meadows at 3 Lp. and 1 rf. In other sections of the area he estimated the loss at 3 Lp. 20 wf, 60 rf. trees.

12. Mill Creek:

Prior to 1940 this area had been given very little attention. In 1941 Hall calculated the 1940 loss in fir at 12 trees.

1941 - Hall reported 17 dead white fir trees.

13. Loomis:

This isolated area has never been examined although potentially it is important from an insect standpoint. Remote observations have shown losses in fir and white pine.

In the following tables is shown a summary of insect losses by tree species during the 13 years previous to 1943 as reported by the various men concerned with the annual examinations.

TABLE IV - Ponderosa pine - Sugar pine losses, 1930 to 1942

	Unit losses in number of trees killed												
Unit:	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
1.		20									2	2	
2.		8		8							11		10
3.											1		
4.		15			5					5	2		
5.													
6.													
7.													
8.													
9.													
10.											1		
11.													
12.													
13.													
		43		8	5					5	17	2	10

Table V. - Jeffrey pine losses, 1930 to 1942

	Unit losses in number of trees killed												
Unit:	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
1.	6			8	2		2	6		8	28	6	6
2.					4		12	12		25	25		20
3.										11	2		
4.										15	11	2	12
5.	20				3						20	21	
6.											21		
10.											11		
	26			8	9		14	18		59	118	29	38

Table VI - Lodgepole pine losses, 1930 to 1942.

Unit:	Unit losses in number of trees killed												
	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
1.					6						1		
2.													
3.	300	500			1	12					50		
4.		140									15		
5.													
6.	80	575			4							11	
7.													
8.		450		9									
9.				19							61		
10.											50		
11.				8							6		
12.													
13.													
	380	1665		36	11	12					183	11	

Table VII - White and red fir losses, 1930 to 1942.

Unit:	Unit losses in number of trees killed												
	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
1.											5	3	
2.					4						113		
3.											2		
4.													
5.					4								
6.		3000			22		10				1		
7.													
8.													
9.											50		
10.											2		
11.		4000			50					150	81		
12.											12	17	
13.													
		7000			80		10			150	266	20	

Although considerable white pine has been killed during the period, and while several investigators have mentioned in their reports, that the mountain pine beetle has been active in this species, there has never been any estimates made by them of the amount of this loss. I, myself, noticed rather heavy mortality in white pine at various times while passing thru the park. The first note of such damage was made in the fall of 1938 when a total of 67 recently killed white pines were noticed along the Loop road from the south gate to a point immediately above Summit Lake. Again in 1941, recently faded white pines were evident along this same stretch, although the loss appeared to be much less than in 1938. Since 1941 this type of damage has greatly diminished but enough infestation remains to deserve the rating of potential hazard. Since white pine here is an important cover species, as well as a beautiful park tree of the higher ranges, it should be given the fullest protection against barkbeetles.

DIRECT CONTROL

During the past 13 year period a few attempt have been made to reduce infestations by direct control measures. These projects have been rather limited in extant and sporadic in character. Lacking a coordinated plan for a comprehensive long-term campaign directed against the insect enemies of the Park forests they resulted in a seasonal attacks on local infestations thought at the time to be sufficiently damaging to warrant some kind of action other than just watching the trees go out. Because an over-all control plan had not been adopted they have been limited to small local areas, generally on campgrounds, or in the immediate vicinity of developed sites. Their effect on the overall infestations has been extremely limited in effecting reductions of losses. They have, in most cases, been successful in securing an immediate reduction of losses on the areas covered by the work, they did not insure these areas against reinfestation by beetles moving in from outside, and in most cases adjacent, infested stands. At best this type of control program results in the destruction of a few beetle broods which may happen to trespass on forbidden ground. Usually however, this practice degenerates into a snag falling contest with the beetles on the winning end, even though the work is carried on over a long term of years. What is needed for this park is a control program based on spheres of influence defined by natural topographical conditions and type constituents. With such a plan it would be possible to extend the control work sufficiently to cover each infestation in its entirety and thereby reduce the entire insect population leaving no potential residue to reinfest the area. Admitted there are certain administration difficulties involved in this plan, nevertheless the prime purpose of any and all control projects, is to effect a reduction in beetle losses by preventing beetle attacks, and not to let the work degenerate into a snag falling, sanitation, job.

Control work so far accomplished in the park has either been done by day labor or with CCC crews. In either case it has been carried out with accepted methods, principally peel and burn of infested bark, and has been under the direction of competent supervisors whi had sufficient pretraining to insure efficient spotting and treating.

The first control work recorded in Bureau files was that done in 1933. There are no statistics at other than of some work done locally near Manzanita Lake in Jeffrey pine stands. Also a few lodgepole pine trees were treated with oil sprays at Grassy Lake (?) and Juniper Lake. Salman questioned the efficacy of these treatments and concluded that the oil method was ineffective in destroying the mountain pine beetle broods.

In the fall of 1933 Augustine carried out control work locally on several small areas; principally campground sites. His work was efficient and conscientiously done but was limited to the used sites.

W. C Hale conducted a limited amount of control work in 1934 at Manzanita Lake, Lost Creek, Summit Lake, Butte Lake, and in Warner valley.

There are references in Bureau files to control work done in 1936 and 1937 but there are no statistics on file of this work. Similiary some work was done in 1939, 1940, and 1941. Hall refers to work done in these last two years but it is only a reference.

In 1938 Barton carried out a very limited amount of work at Manzanita Lake, Lost Creek, and Summit Lake with CCC crews.

A resume of these projects, or rather a series of small detached jobs, is given in the following section for each that we have any statistical records.

Control work conducted in 1933.

This work was done in the fall period, September, October and November under the supervision of Wm. B. Augustine, Park Service appointee.

4. Butte Lake. Campround area - 280 acres. October

Jeffrey pine	3	trees - Peel and burn
Ponderosa pine	3	" " "
Lodgepole pine	5	" Penetrating oil

1. Manzanita Lake. Campground and vicinity - 320 acres.

Jeffrey pine	8	trees - Peel and burn

2. Lost Creek. Highway strip, 10 chs on each side of road.

Jeffrey pine	17	trees - Peel and burn
Ponderosa pine	2	" " "
Sugar pine	1	" " "

3. Warner Valley. Small area near ranger station.

Jeffrey pine	5	trees - Peel and burn
Lodgepole pine	1	" " "

9. Juniper Lake. Small areas around the lake.

Lodgepole pine 19 trees - Penetrating oil

Headquarters at Mineral. 80 acres

Ponderosa pine 3 trees - Peel and burn.

Table VIII - Control Statistics, 1933

Area:	Treated Spp.	Number:	Volume:	Cost Per Tree:	Per MBM:	Total
4. Butte Lake	JP	3	8,000			
	PP	3	3,120			
	LP	5	1,360			
		11	12,580	$13.90	$12.16	$153.00
1. Manzanita Lake	JP	8	8,000	$11.00	$11.00	$ 88.00
2. Lost Creek	JP	17	17,000			
	PP	2	7,570			
	SP	1	4,080			
		20	28,650	$16.64	$11.62	$332.74
3. Warner Valley	JP	5	11,330			
	LP	1	3,500			
		6	14,830	$11.44	$ 5.78	$ 68.66
9. Juniper Lake	LP	19	5,630	$11.46	$38.64	$217.60
Headquarters (Mineral)	PP	3	16,340	(000 crews - No cost record)		
		67	76,030			$860.00

Table IX - 1933 Control - Individual tree record.

Area:	Species:	Tree No.:	DBH:	Height:	Primary Insects
4. Butte Lake	JP	1	50	5	DJ-Dv
	JP	2	44	6	DJ-Dv
	PP	3	36	5	Db
	PP	4	14	1	Db
	PP	5	12	1	Db
	JP	6	34	5	DJ
	LP	7	16	3	Dm
	LP	8	12	1	DM
	LP	9	24	4	Dm
	LP	10	22	3	Dm
	LP	11	22	3	Dm
1. Manzanita Lake	JP	1	20	4	Dj
	JP	2	26	5	Dj
	JP	3	30	5	Dj
	JP	4	26	5	Dj
	JP	5	34	3	Dj
	JP	6	26	4	Dj
	JP	7	40	6	Dj
	JP	8	34	5	Dj
	JP	9	26	4	Dj
2. Lost Creek	JP	1	24	4	Dj
	JP	2	26	5	Dj
	JP	3	20	3	Dj
	JP	4	22	3	Dj
	JP	5	16	4	Dj
	JP	6	60	6½	Dj
	JP	7	20	3	Dj
	JP	8	24	3	Dj
	JP	9	14	1	Dj
	PP	10	14	1	Db
	JP	11	48	6	Dj
	JP	12	28	5	Dj
	JP	13	12	1	Dj
	PP	14	32	6	Db
	JP	15	28	2	Dj
	JP	16	26	4	Dj
	SP	17	50	7	Dm
	PP	18	54	7	Db
	JP	19	12	1	Dj

Table IX - Continued.

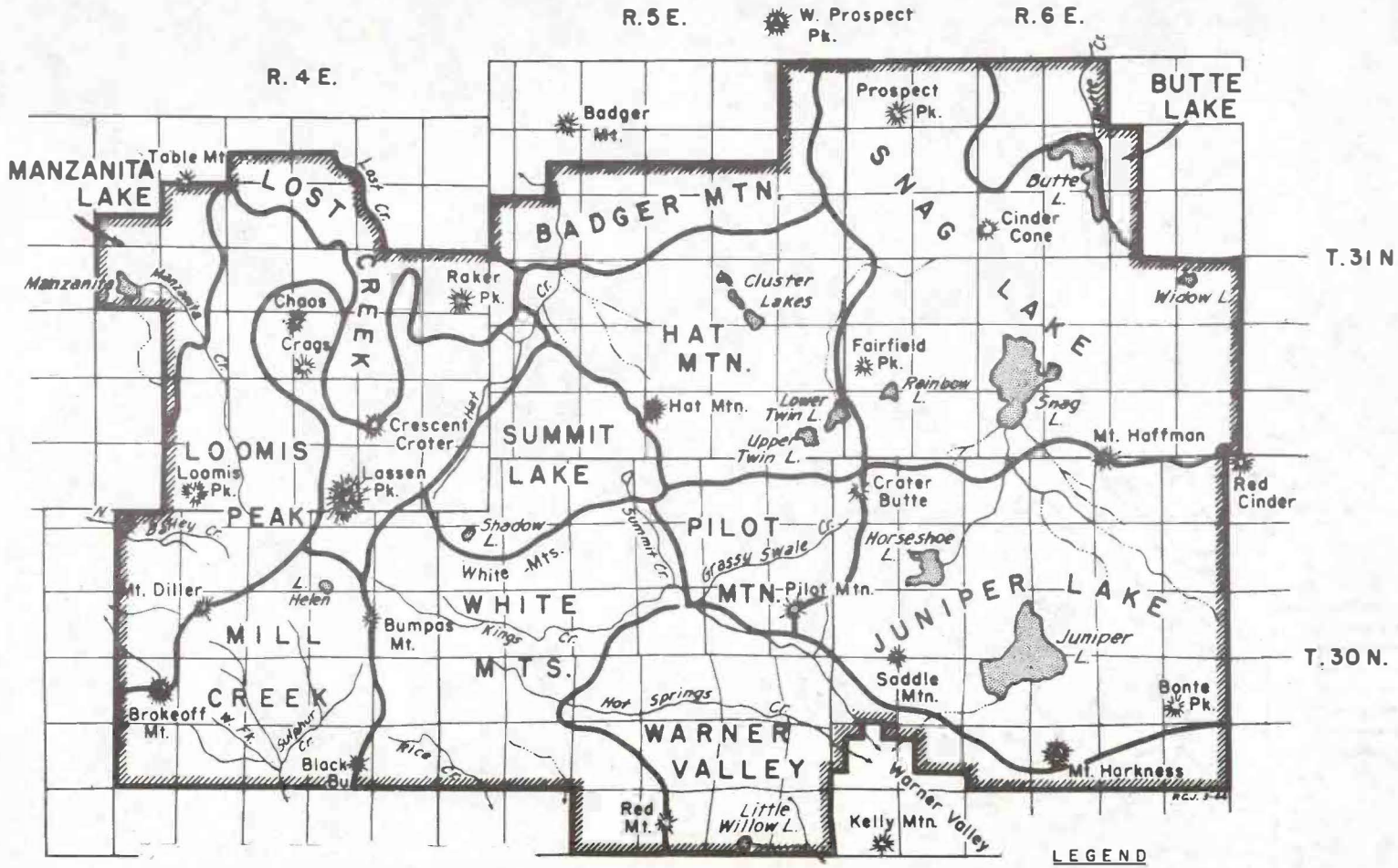
Area:	Species:	Tree No.:	DBH:	Height:	Primary Insect:
9. Juniper Lake	LP	1	26	4	Dm
	LP	2	20	4	Dm
	LP	3	22	3	Dm
	LP	4	18	3	Dm
	LP	5	18	3	Dm
	LP	6	12	1	Dm
	LP	7	26	4	Dm
	LP	8	24	4	Dm
	LP	9	22	2	Dm
	LP	10	16	3	Dm
	LP	11	18	3	Dm
9. Juniper Lake (Horseshoe Lake)	LP	1	26	4	Dm
	LP	2	12	2	Dm
	LP	3	24	4	Dm
	LP	4	16	3	Dm
	LP	5	14	2	Dm
	LP	6	16	3	Dm
	LP	7	24	4	Dm
	LP	8	12	3	Dm
5. Warner Valley	JP	1	44	7	Dj-Dv
	JP	2	50	7	Dj
	JP	3	36	6	Dj
	JP	4	18	2	Dj
	JP	5	16	1	Dj
	LP	6	20	4	Dm
Headquarters (Mineral)	PP	1	60	9	Db-Dv
	PP	2	48	9	Db
	PP	3	34	6	Db

Table X - Control Statistics 1934. W. C. Hale's report of costs.

Area:	Spp:	Treated Number:	Treated Volume:	Control Cost Per Tree:	Control Cost Per MBM:	Control Cost Total
1. Manzanita Lake	JP	2	2,210			
	LP	6	180			
		8	2,390			
2. Lost Creek	JP	4	17,870			
	RF	4	3,830			
		8	21,700	$11.09	$ 7.59	$643.00
6. Summit Lake	LP	4	770			
	RF	25	32,720			
		29	33,490			
4. Butte Lake	JP	2	4,440			
	PP	5	9,360			
	LP	2	760			
		9	14,560			
5. Warner Valley	JP	3	4,940			
	WF	4	2,970			
		7	7,910	$11.01	$ 5.08	$155.00
		61	80,050			$798.00

Table XI - Control Statistics 1938. Barton's report of costs.

Area:	Spp:	Treated Number:	Treated Volume:	Control Cost Per Tree:	Control Cost Per MBM:	Control Cost Total
1. Manzanita	JP	6				
2. Lost Creek	JP	12				
6. Summit Lake	RF	10				
		28				



UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
DIVISION OF FOREST INSECT INVESTIGATIONS

FOREST INSECT SURVEY

LASSEN VOLCANIC NATIONAL PARK
CALIFORNIA

SEASON OF

SCALE MILES
0 1 2

LEGEND

CONIFEROUS STANDS
- Infestation Normal
- Light
- Moderate
- Heavy

BOUNDARY LINES
- Park Boundary
- Entomological Units

GROUND SAMPLES
- Plots
- Strips
- Observation Plots